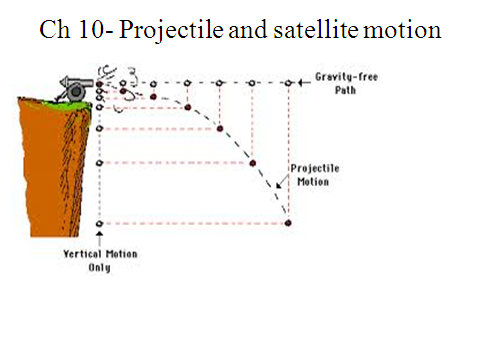
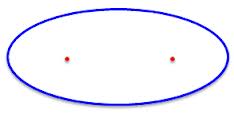
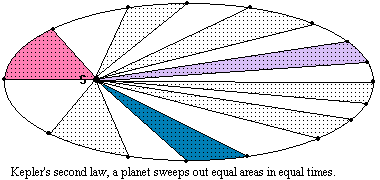
8 Motion in Circles

1. An object that turns on an axis is \_rotating\_, but if it turns on an axis that is external it is \_revolving\_\_\_. So when earth rotates, it takes \_1 day(s) and revolving takes 365 day(s).
2. Based on Rotational Inertia- why will a post with a weight at the top fall faster than or a post with the weight at the bottom? Explain.
3. Torque- The product of force and lever-arm distance, which tends to produce rotation. What is the torque produced if a 5 N force is applied by a wrench that is 10 cm long? (Hint: convert to Meters)
4. On a speeding disk, where one bug is .1 meters from the edge and the other bug is 1 meter from the edge, they will have the same \_\_\_\_Rotational speed -(angular speed) \_\_\_\_speed but the bug close to the edge will have the greatest \_\_Linear or Tangential\_\_ speed.
5. The point where an object can be balanced is called the Center of gravity, and for some objects like a donut, it may be outside of object.
6. If you are building an irregular shaped sculpture, you could make sure it has stability if a line drawn straight down from the center of gravity is inside the base
7. Centripetal force is always toward the center of the circle and perpendicular to an object’s motion. It is caused by inertia which tends to make an object move in a straight line and a force like \_\_gravity\_\_which keeps the moon in orbit. What 3 factors can increase centripetal force? Centripetal force **INCREASES** if the object is moved **FASTER, if the** object’s mass is **INCREASED**, the radius of the circle is **DECREASED**.
8. What force is produced if a mass of 10 kg is swung with a velocity of 2 m/s on a string that is 1 meter long?
9. IF the centripetal force is removed the object will move \_in a straight line because NO force acts on it (no centrifugal force)- only inertia
10. centrifugal force is not real, but it seems to hold objects moving in a circle into place.
11. in space stations of the future you would need to Simulate a Gravity of 1g. The most effective way to do this would be to build a \_large\_sized station that moves. \_\_slowly\_\_.
12. Free fall in a spinning object mimics gravity by providing a support force.
13. the law of universal gravitation developed by Newton states that the gravitational force exists between all objects that have mass. And that the strength of the gravitational force depends on the mass of the objects and the distance between them, with the distance having the greatest effect of gravity.
14. Calculate your gravitational force if your mass is 10 kg and you are standing on the moon. The mass of the moon is 7.36 × 1022 kg and the radius of the moon is 1.74 × 106 m. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
15. A satellite launched above Earth at more than 8 kilometers per second will have a noncircular ellipse orbit.
16. A satellite in an elliptical orbit does not move at a constant speed. It will move faster as it approaches the large mass it circles and slower as it moves away from it.
17. Rotating objects like solar systems have Angular Momentum. As gravity pulls the “arms” inward, the spinning speed of the system will increase.
18. Which will roll faster down an incline? A ring or a ball if they have the same mass and diameter? WHY? The object with the greatest rotational inertia will roll down hill the slowest When the mass is concentrated on the outside (a ring) it has a greater momentum than if it is solid. the "rotational mass" of a solid sphere will be **smaller** than the "rotational mass" of the hollow sphere. This is because the solid sphere will have more of its mass at a smaller distance from the axis of rotation. With its **smaller** "rotational mass", the **solid sphere** is easier to rotate so the **solid sphere** will roll down a hill faster.
19. If a **gravitational force** ***is*** the keeping a satellite in orbit, the gravitational force is always towards the center of the planet
20. We Still do not know WHY things fall. (only how)
21. Kepler’s Laws are now known to be the result of the conservation of energy and angular momentum. Kepler’s laws- still apply to the behavior of every planet and satellite- even though they are no longer considered correct.
22. Kepler’s first law states that the path of each planet around the sun is an ellipse with the sun at one focus.
23. Newton theorized that the Sun must be providing a centripetal acceleration to the Earth (and all the other planets in our solar system) in order for it to maintain its roughly circular orbit. Newton figured out that the force of gravity is the source for the acceleration.
24. Cavendish found the gravitational constant was equal to= G= 6.6.7 X 10 -11 N-m ²/kg² by experimentation.
25. LAW OF UNIVERSAL GRAVITATION states that Every object attracts every other object with a force that is directly proportional to the mass of each object & is inversely proportional to the square of the distance between their centers.
    * F = G m1m2
    * d²
26. Gravitational Fields- area around an object where a force is applied. It is greatest on earth on the surface because earth’s mass is below you and it is zero in the center of the earth. If you fell in a hole at the north pole that goes all the way through the earth. You would increase speed when falling until you reach center, then slow down and start back if you reached the south pole.
27. Zero-g = weightlessness. Satellites appear to be weightless in space because they are free falling toward earth while they are in orbit.
28. Albert Einstein-
29. Proposed that gravity is an effect of space
30. Mass changes the space about it
31. Mass causes space to be curved and other bodies are accelerated b/c they move in this curved space/
32. Anything that has mass is surrounded by a magnetic field
33. General Theory of relativity- in every test- gives correct results. Slightly different from Newton’s laws
34. Predicted the effects of a black hole- capturing light due to gravity- no light escapes.
35. Theory is not yet complete- doesn’t explain how masses curve space.
36. Einstein’s Theory of Gravitation states that massive objects cause a distortion in space-time, which is felt as gravity. He perceived a gravitational field as a geometrical warping of 4- d space and time and that bodies could put dents in the space time. The more massive the ball, the greater the dent or warp. In stead of a straight line things would orbit/roll across the curved /indented surface.
37. Gravity
    1. If the sun collapsed but had the same mass-the pull on earth would be the same. (same mass)
    2. If you were standing on the earth and it started shrinking, but kept the same mass, your weight would increase. (closer to the center of gravity)
    3. If you remain the same distance from the center of the imploded star that becomes a black hole, you would remain in the same position you were in, because the mass has not changed after the supernoma.
    4. If you are in a space ship ½ way between the earth and moon, you would be pulled to the earth (greater mass)
    5. If a star collapses (no additional mass) but you remain the same distance from the center, your weight would not change.
38. Black holes--an extremely massive object that can bend light back to the object. as a star collapses (less distance to outer edge) the gravitational attraction increases. The smaller it shrinks, the greater the attractive/gravitational force.
39. Compare the times of balls it takes a ball to fall, if one is thrown up, one dropped and one shot straight.

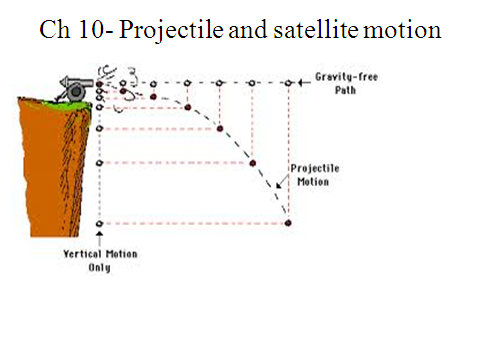
Label the following on the ellipse. Perigee, Apogee, Location of sun. Location of fastest speed and location of slowest speed.

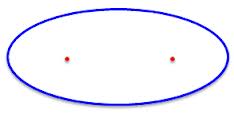
-The paths of the planets are ellipses with the center of the sun at one focus.

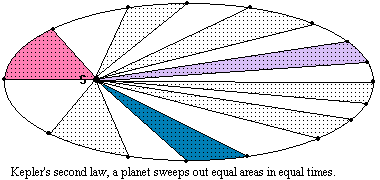
1. Using Kepler’s Second Law- Compare the time intervals for the 2 dark shaded areas. The line from the sun to any planet sweeps out equal areas of space in equal time intervals
2. If an object is circling the moon, which is the satellite? EXPLAIN A satellite is a lower mass body that orbits around a higher mass body.
3. Thus, planets move fastest when closest to the sun, slowest when farthest away.
4. Perturbations- wobbling of planets in orbits are used to predict unknown planets which may be affecting its orbit and found Neptune
5. Freefall— accelerating downward b/c of an unbalanced gravitational force
6. Escape velocity is the maximum velocity required to escape the earth’s orbit.
7. Geostationary orbits are synchronized with earth’s rotation at 36000 km of height.
   * + - 1. Motion in Circles
8. An object that turns on an axis is \_\_\_\_\_\_\_\_\_\_\_\_\_, but if it turns on an axis that is external it is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. So when earth rotates, it takes \_\_\_\_\_\_\_\_\_\_\_\_\_\_day(s) and revolving takes \_\_\_\_\_\_\_\_\_\_\_\_\_day(s).
9. Based on Rotational Inertia- why will a post with a weight at the top fall faster than or a post with the weight at the bottom? Explain. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. Torque- The product of force and lever-arm distance, which tends to produce \_\_\_\_\_\_\_\_\_\_\_\_\_. What is the torque produced if a 5 N force is applied by a wrench that is 10 cm long? (Hint: convert to Meters)
11. On a speeding disk, where one bug is .1 meters from the edge and the other bug is 1 meter from the edge, they will have the same \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ speed or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_speed but the bug close to the edge will have the greatest \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ speed or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_speed.
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F = G m1m2

d²

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